



Testing ON-OFF Gecko Adhesive Grippers in Microgravity

Grappling Non-Cooperative Targets

Grappling non-cooperative targets has not yet been demonstrated in space.

With traditional grippers, this would require large, expensive systems with precision perception, GN&C, and control.

Using switchable adhesive grippers could significantly reduce the requirements on other systems and bring down costs.

Potential uses include:

Satellite servicing

Orbital debris removal

Robotic inspection of the ISS

Astronaut tools.

Development Team

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Future collaborators include:

NASA Johnson Space Center

(ISS and Crew Systems Office)

DARPA Phoenix Mission

NASA Goddard Space Flight Center

(Restore Satellite Servicing Mission)

Proposed Flight Experiment

Experiment Readiness:

- The experimental apparatus is partially assembled and can be ready for flight within 4 weeks.

Test Vehicles:

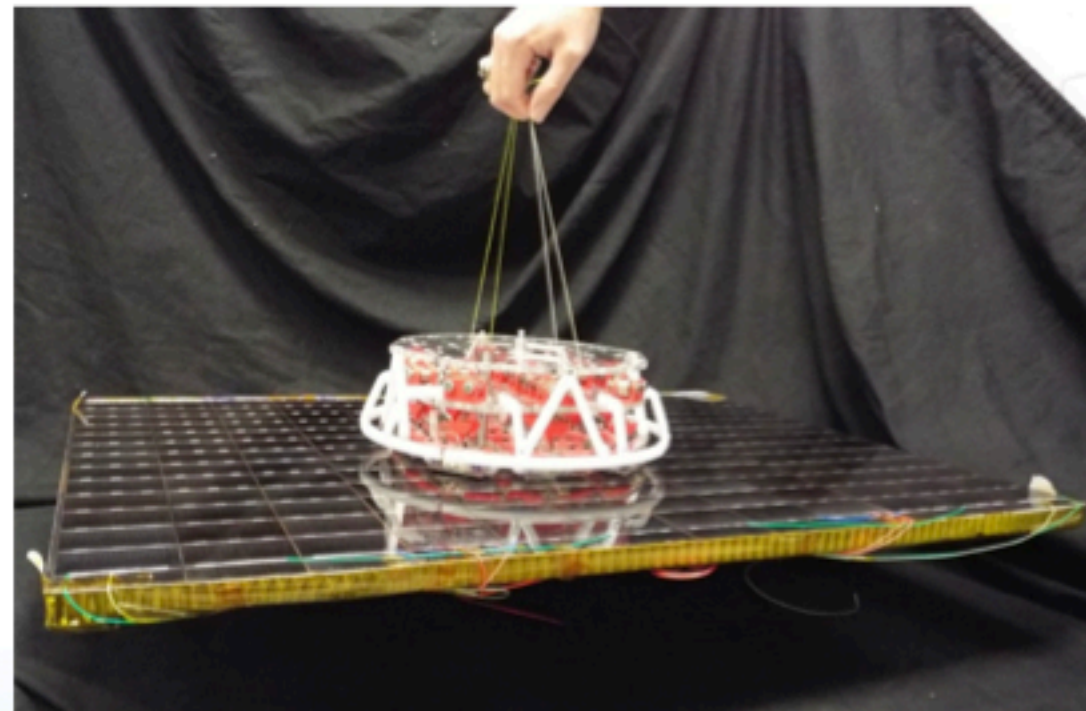
- Parabolic Aircraft.

Test Environment:

- Request zero-g environment.

Test Apparatus:

- The Gecko Gripper Tool is a hand operated prototype.
- Swappable panels of spacecraft material are mounted to a six-axis force/torque sensor on an aluminum frame which is bolted to the aircraft floor.
- Cube and Shield pieces allow capture of floating objects.



Gecko Gripper Tool Lifting GEO Solar Panel

Technology Maturation

Current TRL: 5

TRL 6:

- Test in full 6 degree of freedom zero gravity (parabolic airplane)
- Build a high fidelity tool using flight materials and design practices/margins
- Test full tool (not just adhesive) in an environmental chamber
- high fidelity models of performance

TRL 7:

- Define flight requirements & interfaces
- Build Engineering Unit
- Pass Critical Design Review
- Perform operational testing
- Possible testing at the ISS

Objectives of Experiment

- Demonstrate grappling of small floating objects (10kg and 100kg) using a floating tool in full 6 degree of freedom zero-g environment
- Grapple a high-inertia object using a floating tool

Flight data includes gripper preload, alignment, and pull off force and vector for a variety of spacecraft materials. This will inform mission planning and could impact size/number of pads on future tools, or alter the engagement mechanism design.